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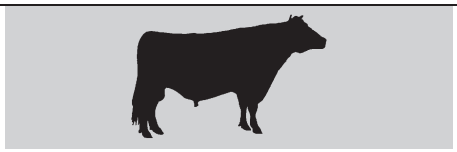

Effects of steer breed composition on feedlot performance and carcass traits[1]

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ABSTRACT

Records of steers (n = 3,554) of known breed composition were used to assess the effect of breed composition on feedlot performance and carcass traits. Feedlot ADG was greater ($P \leq 0.01$) for Angus and Red Angus than for Brangus and Polled Hereford steers. Longissimus muscle area ranged from 81.6 cm^2 for Beefmaster carcasses to 85.7 cm^2 for Red Angus carcasses and was affected by breed ($P < 0.01$). Marbling score was greatest ($P = 0.03$) in Angus carcasses and greater ($P < 0.05$) in Brangus than in Polled Hereford and Beefmaster carcasses. All following results are relative to a British base. Direct additive effects for backfat thickness in Continental ($P < 0.01$), American ($P < 0.01$), and Zebu ($P < 0.05$) breeds were −0.6, −0.2, and −0.1 cm. Marbling score and USDA QG direct additive effects ($P < 0.01$) were large negative values for American, Continental, and Zebu. The Continental direct additive effect ($P < 0.01$) for LM area was 9.7 cm^2. Calculated YG direct additive effects ($P < 0.01$) were −0.2 and −1.0 for American and Continental breeds, respectively. Direct heterosis effects ($P < 0.01$) in British × American steers were present for ADG and marbling score, whereas Continental crosses tended to exhibit direct heterosis effects ($P < 0.05$) for LM area and backfat thickness. Steer breed composition influenced finishing performance and carcass traits. This information is important for breed selection, finishing, and marketing decisions.

Key words: beef cattle, breed, feedlot, carcass, genetic effect

INTRODUCTION

Commercial cow-calf operators select from many diverse breeds for incorporation into mating systems (Gardner et al., 1996). Information about breed differences is needed to improve commercial cattle breeding systems. Assessment of carcass traits from different breeds or breed crosses is useful in determining the potential value of divergent genetic resources for improving beef production profitability (Wheeler et al., 2001). Researchers documented dramatic effects of breed type on feedlot performance and carcass traits comparing various English and Continental breed combinations (DeRouen et al., 2000; Reinhardt et al., 2009; Trejo et al., 2010). Similarly, important differences in Brahman-influence cattle versus British cattle for feedlot performance and carcass characteristics are reported (Paschal et al., 1995; Sherbeck et al., 1995; Baker et al., 2001; Thrift et al., 2010; Wheeler et al., 2010).

Genetic analyses of these traits are often limited in the number and combination of breeds evaluated in one data set. The present analysis, which incorporates steer finishing and slaughter data from seedstock and commercial cow-calf operations, evaluated straightbred steers of 5 breeds and crossbred steers of 4 genetic types representing 24 breeds for finishing performance and carcass traits over a 13-yr period. This study also provides direct breed and breed-type comparisons on cattle representing numerous farms of origin as opposed to comparable efforts that sourced cattle for finishing from a single breeding operation (Paschal et al., 1995; DeRouen et al., 2000; Baker et al., 2001; Wheeler et al., 2001, 2005, 2010). It provides breed comparisons of straightbred steers and estimates of direct and heterosis effects within a diverse group of industry-representative crossbred

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steers. Therefore, the objectives of this investigation were to evaluate the effects of sire breed and steer breed composition on feedlot performance and carcass characteristics.

MATERIALS AND METHODS

Steer Records

Records of steers (n = 3,554) with known breed composition that were consigned to the Mississippi Farm to Feedlot Program from 1993 to 2006 were used in this study. Descriptive statistics for these steers are reported in Parish et al. (2012).

An on-farm preconditioning period was strongly suggested before shipment, but it was not required and was left to the owner's discretion. The Mississippi Farm to Feedlot Health Committee recommended a preconditioning program that included use of modified-live virus vaccine products against infectious bovine rhinotracheitis, bovine parainfluenza-3, bovine viral diarrhea, and bovine respiratory syncytial virus. In addition, 7-way clostridial and *Mannheimia haemolytica* vaccinations were recommended. Other suggested preshipment management practices were castration, dehorning or tipping horns, deworming with a product effective against lungworms, and feeding calves to obtain a target ADG of 0.5 to 0.7 kg/d. Producers were advised to wean calves at least 30 d ahead of feedlot shipment.

Producers were encouraged to select calves that were representative of their breeding and management programs. Calves submitted to the program were accompanied with an enrollment form that provided information regarding calf birth date and the owner's knowledge or estimate of sire and dam breed composition. A legend of breed codes was provided to assist in entry of this information on the form and to ensure matching of the intended breed names by the producers completing the form and the interpreted breed names by persons entering data in the database. Steer breed composition was determined by sire and dam breed composition.

Calves were required to have a minimum BW of 227 kg when shipped to the feedlot. Each program year, cattle were shipped to a feedlot (Hitch Enterprises, Garden City, KS, from program years 1993 to 1994 through 2003 to 2004; DM&M Farms Inc., Cimarron, KS, from program years 2004 to 2005 through 2005 to 2006) in autumn (dates ranging from August 21 to November 17, with 16 out of 23 shipment dates occurring between October 2 and October 26). On the day of shipment to the feedlot, calves were weighed and pooled into truckload (22,226 kg) lots at producer farms or Mississippi Agricultural and Forestry Experiment Station sites. Cattle were weighed before shipment to the feedlot, upon arrival at the feedlot (initial BW), and then again at the end of the feeding period. Cattle were processed and weighed individually. Calves that experienced morbidity were treated according to feedlot protocol.

Cattle were sorted into feeding groups based on initial BW, frame size, and BCS by trained feedlot personnel. Feeding groups were composed of cattle from one or more farms of origin in one feeding group, and the number of steers sent per owner ranged from 2 to 32 head. Cattle were offered a feed ration between 24 and 36 h after arrival to the feedlot. At both feedlots, cattle were fed a traditional feedlot diet with 4 diet changes until cattle were adapted to the finishing diet.

Cattle were marketed on a live BW basis, and all cattle in a pen were slaughtered when the majority of the pen averaged 1.22-cm rib fat as determined by feedlot management based on visual appraisal by trained pen riders. Steers were weighed before shipment to the packer, and carcass data were collected at time of slaughter by individual USDA graders at the following plants: Cargill Meat Solutions Corporation, Cargill Inc., Wichita, Kansas; Tyson Fresh Meats (formerly IBP), Emporia, Kansas; and National Beef Packing Co. LLC, Dodge City, Kansas.

Statistical Analysis

Only records of steers with reported known sire and dam breed composition were used in this study. Dairy-influence calves were excluded from the data set. Breeds with insufficient observations were removed from the straightbred cattle analysis. For this analysis, breeds were designated as Angus (**AN**, n = 401); Red Angus (**AR**, n = 76); Beefmaster (**BM**, n = 79); Brangus (**BN**, n = 201); and Polled Hereford (**HP**, n = 191), where n indicates the number of records used in the analysis for each breed after data exclusions were done. For the analysis of cattle by breed group, AN, AR, Belted Galloway, Horned Hereford, HP, and White Park were considered British breeds; Blonde D'Aquitaine, Braunvieh, Charolais, Chianina, Gelbvieh, Limousin, Maine-Anjou, Romagnola, Salers, Simmental, and Tarentaise were considered Continental breeds; Barzona, BM, BN, Red Brangus, Simbrah, and Santa Gertrudis were considered American breeds; and Brahman was considered a Zebu breed.

To account for differences across feeding groups, feeding group was included as a random variable in all models. Farm of origin was also included in the models as a random variable. All data were adjusted to a common age as opposed to a constant fat thickness. Data collected on cattle removed from the program before finishing, as a result of poor health or mortality, were excluded from all statistical analyses. Observations were considered outliers and removed from the data set for a particular model when a response variable deviated from the mean greater than 4 SD.

For the analysis by steer breed of straightbred steers, data were analyzed with the MIXED (for continuous dependent variables) and GLIMMIX (for categorical and percentage dependent variables) procedures in SAS (SAS Institute Inc., Cary,